

TROPICAL CYCLONE 02B

I. HIGHLIGHTS

Tropical Cyclone 02B was the deadliest and most destructive natural disaster of 1991. It occurred nineteen years after an estimated 300,000 lives were lost in a similar cyclone which struck the low-lying Ganges River delta region of Bangladesh. On April 29 and 30, 1991, Tropical Cyclone 02B (TC 02B) devastated the coastal city of Chittagong (located 115 nm (210 km) southeast of the capital city of Dacca) and the surrounding area with winds in excess of 130 kt (65 m/sec) and a 20-foot (6 m) storm surge. The official death toll was estimated at 138,000, and the damage at US\$1.5 billion. The death toll might have been higher than that in 1970, but according to newspaper reports an estimated 2 to 3 million people were evacuated from the coastal region prior to the onset of destructive winds and massive storm surge. A survey of survivors by researchers from the Centers for Disease Control based in Atlanta, Georgia indicated the major reason that many people did not heed the warnings was that they did not believe the cyclone would be as severe as forecast.

II. TRACK AND INTENSITY

On 22 April, westerly winds and persistent cloudiness in the equatorial regions of the North Indian Ocean spawned a large cyclonic circulation which became evident in the synoptic data and satellite imagery over the southern Bay of Bengal. By 24 April, the cloud mass associated with the circulation encompassed nearly the entire Bay of Bengal. Ships reported that surface winds had increased to over 30 kt (15 m/sec). These data prompted the issuance of a Tropical Cyclone Formation Alert at 241400Z. The first warning followed shortly afterward at 241800Z when the tropical cyclone showed signs of rapid development. Steady intensification continued as TC 02B passed through the axis of the subtropical ridge on 27 April and recurved. On 28 April, acceleration started due to the influence of stronger mid-level southwesterlies. The southwesterlies aloft also enhanced upper-level outflow, and TC02B rapidly intensified into a rare Bay of Bengal cyclone of super typhoon intensity (Figure 3-02B-1). At landfall, the center of the eye of TC 02B passed 30 nm (55 km) south of Chittagong at 291900Z. Official reports stated that the destructive fury lasted eight hours in Chittagong. As the tropical cyclone weakened rapidly over the mountainous terrain inland, its torrential rains caused extensive flooding in the region.

III. FORECAST PERFORMANCE

Initial JTWC track forecasts moved TC 02B slowly northwestward toward the east coast of India as the subtropical high over India retreated westward. However, the mid-tropospheric subtropical high located to the east of the system over central Thailand remained fixed and acted as the primary steering mechanism. The cyclone tracked slowly northward between that subtropical high and the high over India. After 271800Z, JTWC anticipated that recurvature would in fact occur, and subsequent warnings indicated that TC 02B would strike the coast of Bangladesh (Figure 3-02B-2). The actual point of landfall near Chittagong on the coast of Bangladesh was correctly forecast after the 281200Z warning, 31 hours prior to landfall.

The first few JTWC forecasts indicated that TC 02B would track slowly northwestward and intensify before making landfall in eastern India. JTWC forecasters anticipated significant development because of the combination of weak vertical wind shear and strong speed divergence aloft, both north and south of the cyclone. On the 280600Z warning, JTWCs predictions indicated the tropical cyclone

would cross the coast of Bangladesh at an intensity of about 100 kt (50 m/sec). Commencing with the warning at 290000Z, JTWC intensity rationale changed as the Center forecast that the maximum sustained surface winds at landfall would exceed 120 kt (60 m/sec) due to anticipated continued rapid intensification.

IV. IMPACT

In terms of storm surge, the Bay of Bengal is the most dangerous tropical cyclone basin in the World. Not only are the physical characteristics of the basin conducive to producing very large storm surges, but the low lying coastal areas are heavily populated. In addition to the tremendous loss of life due to TC02B, ten million people, one-tenth of the population of Bangladesh, were displaced as an estimated one million homes were destroyed. The human suffering associated with this event was staggering.

Communicating by telephone, JTWC kept the U.S. Embassy in Dacca informed of the cyclone's expected track and characteristics for the 48-hour period prior to it hitting land. This communication squelched rumors that the cyclone would strike the Dacca-Ganges delta region of Bangladesh, and probably prevented an unnecessary evacuation of Embassy personnel.

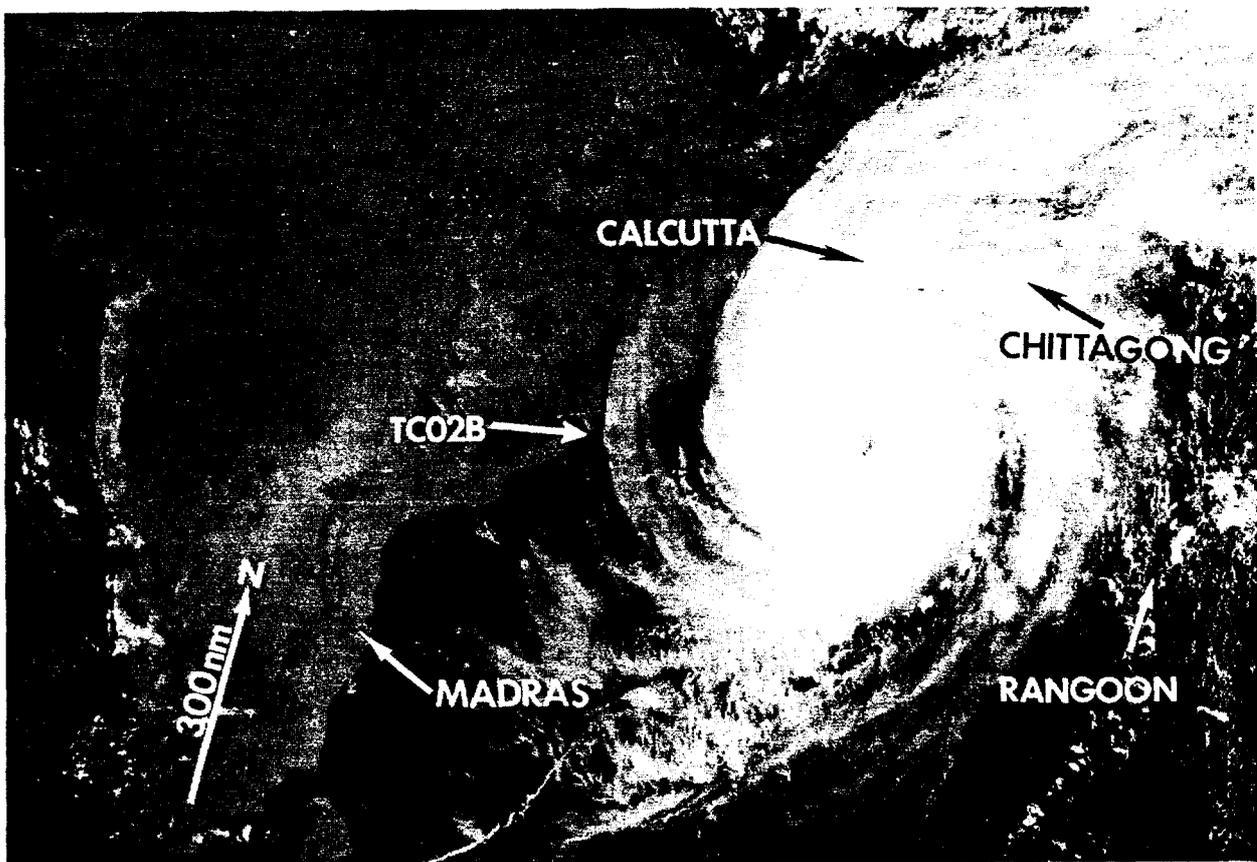


Figure 3-02B-1. TC02B with winds in excess of 130 kt (65 m/sec) bears down on the coast of Bangladesh (28 April DMSP visual imagery).

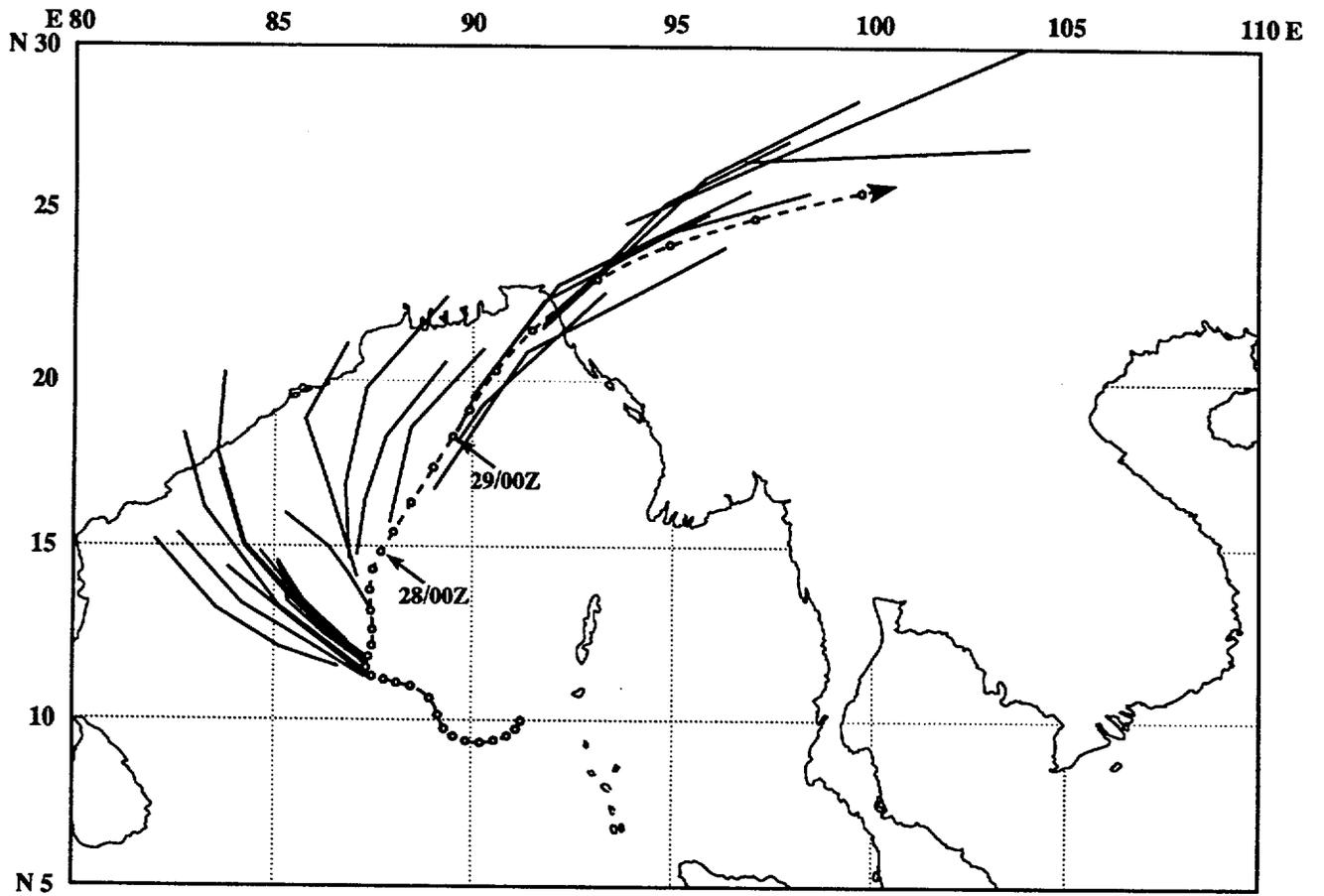


Figure 3-02B-2. Summary of JTWC forecasts (solid lines) for TC02B superimposed on the best track (dashed line).